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Kogiantis 14-4-7-5

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Kogiantis, Achilles G.
Serial Number:	10/603,290
Filed:	06/25/2003
Group Art Unit:	2618
Examiner:	Dao, Minh D.
Title:	METHOD FOR IMPROVED PERFORMANCE AND REDUCED BANDWIDTH CHANNEL STATE INFORMATION FEEDBACK IN COMMUNICATION SYSTEMS

APPEAL BRIEF

Mail Stop AF
Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Applicant now submits its brief following the notice of appeal filed on June 28, 2007.

The Commissioner is authorized to charge the appeal brief fee of $500 to Deposit Account No.

50-1482 in the name of Carlson, Gaskey & Olds for any additional fees or credit the account

for any overpayment.

Real Party in Interest

Alcatel-Lucent, Inc. is the real party in interest as the owner by assignment made to
Lucent Technologies, Inc.

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Related Appeals and Interferences

There are no related appeals or interferences.

Status of Claims

Claims 1-7, 9-13 and 15-17 are pending. Claims 8 and 14 have been cancelled.

Only claims 5, 9 and 15-17 are on appeal.

Claims 1-6 stand rejected under 35 USC 103 as being unpatentable over US Patent No. 7,079,514 ("the Kim reference") in view of US Published Application No. US 2003/0123396 ("the Seo reference").

Claims 7, 9-13 and 15-17 stand rejected under 35 USC 103 as being unpatentable over

the Kim reference in view of the Seo reference and in further view of US Published Application

No. US 2006/0039312 ("the Walton reference").

Status of Amendments

Applicant attempted to amend the claims by incorporating the subject matter of

dependent claim 5 into independent claim 1 by an amendment submitted on May 29, 2007.

The examiner refused to enter that amendment for the reason that it allegedly raises new

issues.

Summary of Claimed Subject Matter

Claims 5, 9 and 15-17 are on appeal. Each of them relates to using transmitted

information for facilitating wireless communications.

Claim 5 depends from claim 1 and recites a method of transmitting information in a

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communication system having at least one multiple antenna system. (page 7, line 4) The method

of claim 5 comprises transmitting over N defined time periods long term information comprising

a correlation value between at least two antennas that is a function of a signal vector received on

the at least two antennas arranged in a particular format and obtained from at least a portion of at

least one of measured or calculated received information where N is an integer equal to 1 or

greater. (page 8, lines 1-9, 21-22; page 9, lines 1-8, 18-19) In claim 5, the long term information

is transmitted by a base station of a wireless communication system. (page 16, lines 15-16)

Independent claim 9 is a method claim reciting a method of transmitting information in a

communication system having at least one multiple antenna system. (page 7, line 4) The method

of claim 9 comprises transmitting over N defined time periods long term information arranged in

a particular format and obtained from at least a portion of at least one of measured or calculated

received information, where N is an integer equal to 1 or greater. (page 8, lines 1-9, 21-22; page

9, lines 1-8, 18-19) The method of claim 9 also includes transmitting short term information.

(page 9, lines 12-18) The long term information is used to inform a receiver which of a finite set

of codes to use to decode the transmitted short term information. (page 14, lines 29-31)

Claim 15 is the other independent claim on appeal. Claim 15 parallels claim 9 but is

focused on receiving rather than transmitting. Claim 15 recites a method of receiving

information in a communication system having at least one multiple antenna system. (page 7, line

4) The method of claim 15 comprises receiving long term information arranged in a particular

format and transmitted over N defined time periods where N is an integer equal to 1 or greater.

(page 8, lines 1-9, 21-22; page 9, lines 1-8, 18-19) The method also includes receiving short

term information related to the long term information (page 9, lines 12-18) and determining

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which of a finite set of codes to use to decode the short term information based upon the long

term information. (page 14, lines 29-31)

Grounds of Rejection to be Reviewed on Appeal

A.   Claim 5 was rejected (along with claims 1-6) under 35 USC 103 as being unpatentable

over US Patent No. 7,079,514 ("the Kim reference") in view of US Published Application No.

US 2003/0123396 ("the Seo reference").

B.   Claims 9 and 15-17 were rejected under 35 USC 103 as being unpatentable over the Kim

reference in view of the Seo reference and in further view of US Published Application No. US

2006/0039312 ("the Walton reference").

Argument

There is no *prima facie* case of obviousness against any of Applicant's claims on appeal.

A. The rejection of Claim 5 under 35 USC 103 as being unpatentable over the Kim reference in view of the Seo reference must be reversed.

Claim 5 includes "transmitting the long term information from a base station." The

Examiner contends that section 0037 of the *Seo* reference teaches this but it does not. Paragraph

0037 is reproduced here:

> [0037] Therefore, in order to correctly report the channel condition, *the UE transmits* HS-DSCH power offset to the Node B. The HS-DSCH power offset is an offset value against a reference power level of HS-DSCH. Upon receiving the HS-DSCH power offset, the Node B transmits an HS-DSCH signal at transmission power determined by increasing the reference HS-DSCH power by the HS-DSCH power offset. In this manner, *the UE can correctly report the quality of a downlink channel* using the HS-DSCH power offset. Table 2

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below shows ***CQI information actually transmitted to the Node B by the UE.*** The UE generates the CQI information as a combination of the TFRC determined from Table 1 and the HS-DSCH power offset, taking into consideration the measured C/I and its performance. In Table 2, the number of cases that can be determined by the UE is 27, so the CQI information is expressed with 5 bits. Since TFRC and HS-DSCH power offset are used in Table 2, a C/I difference between uplink signaling values becomes small. That is, when more information bits are used, a C/I difference between uplink signaling values may become 1 dB, and when less information bits are used, the C/I difference between the uplink signaling values may become higher than 1 dB. (Emphasis added.)

The *Seo* reference clearly teaches that the UE (e.g., mobile station) transmits the CQI (e.g., what the Examiner considers "long term information") to the Node B (e.g., the base station). The only thing transmitted by the base station in paragraph 0037 of the *Seo* reference is the data signal on the HS-DSCH, which is not long-term information. The base station in that portion of the Seo reference does not transmit any "long term information" and, therefore, there is no *prima facie* case of obviousness against claim 5. Even if the proposed combination could be made, the result is not what the Examiner contends and is not the same as the claimed method.

Further, the proposed modification to the Kim reference cannot be made. The Kim reference teaches that a "***mobile station*** determines long-term information and short-term information based on the correlation of characteristics between channels for each antenna using the channel downlink characteristic, ***converts the determined long-term and short-term information to a feedback signal, and transmits the feed back signal to the base station.***" (col. 3, line 65 through col. 4, line 3) (Emphasis added.) As the mobile station transmits the long-term information in the Kim reference, any proposed modification that would replace that operation with a transmission of long-term information from a base station would change the principle of operation of the arrangement of the Kim reference and render it unable to accomplish its intended function. Such a modification to the Kim reference cannot be made and there is no *prima facie*

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case of obviousness.

The proposed combination cannot be made and even if it could there is no *prima facie* case of obviousness against Claim 5 and the rejection of that claim must be reversed.

B. The rejection of Claims 9 and 15-17 under 35 USC 103 as being unpatentable over the Kim reference in view of the Seo reference and further in view of the <u>Walton reference must be reversed.</u>

Applicant respectfully submits that neither of claims 9 or 15 can be considered obvious. Applicant respectfully disagrees with the Examiner's conclusion that paragraphs 0258-0275 of the *Walton* reference teach that long term information is used to inform a receiver which of a finite set of codes to use to decode the transmitted short term information. The Examiner does not provide any explanation for how that is supposedly found in the cited portion of the Walton reference. For convenience, the entirety of the text relied upon by the Examiner in this regard is reproduced here:

> [0258] For simplicity, the receiver architecture shown in FIG. 10B provides the (received or modified) symbol vector streams to each receiver processing stage 1050, and these streams have the interference components due to previously decoded data streams removed (i.e., canceled). In the embodiment shown in FIG. 10B, each stage removes the interference components due to the data stream decoded by that stage. In some other designs, the received symbol vector streams may be provided to all stages, and each stage may perform the cancellation of interference components from all previously decoded data streams (which may be provided from preceding stages). The interference cancellation may also be skipped for one or more stages (e.g., if the SNR for the data stream is high). Various modifications to the receiver architecture shown in FIG. 10B may be made and are within the scope of the invention.

> [0259] FIGS. 10A and 10B represent two embodiments of a receiver unit capable of processing a data transmission, determining the characteristics

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of the transmission channels (e.g., the post-processed SNR), and reporting CSI back to the transmitter unit. Other designs based on the techniques presented herein and other receiver processing techniques may also be contemplated and are within the scope of the invention.

Channel State Information (CSI).

[0260] The CSI used to select the proper data rate and the coding and modulation scheme for each independent data stream may comprise any type of information that is indicative of the characteristics of the communication link. The CSI may be categorized as either "full CSI" or "partial CSI". Various types of information may be provided as full or partial CSI, and some examples are described below.

[0261] In one embodiment, the partial CSI comprises SNR, which may be derived as the ratio of the signal power over the noise-and-interference power. The SNR is typically estimated and provided for each transmission channel used for data transmission (e.g., each transmit data stream), although an aggregate SNR may also be provided for a number of transmission channels. The SNR estimate may be quantized to a value having a particular number of bits. In one embodiment, the SNR estimate is mapped to an SNR index, e.g., using a look-up table.

[0262] In another embodiment, the partial CSI comprises signal power and noise-and-interference power. These two components may be separately derived and provided for each transmission channel or each set of transmission channels used for data transmission.

[0263] In yet another embodiment, the partial CSI comprises signal power, noise power, and interference power. These three components may be derived and provided for each transmission channel or a set of transmission channels used for data transmission.

[0264] In yet another embodiment, the partial CSI comprises signal-to-noise ratio and a list of interference powers for observable interference terms. This information may be derived and provided for each transmission channel or each set of transmission channels used for data transmission.

[0265] In yet another embodiment, the partial CSI comprises signal components in a matrix form (e.g., $N_R \times N_T$ complex entries for all transmit-receive antenna pairs) and the noise-and-interference components in matrix form (e.g., $N_R \times N_T$ complex entries). The transmitter unit may then properly combine the signal components and the noise-and-interference components for the

appropriate transmit-receive antenna pairs to derive the quality of each transmission channel used for data transmission (e.g., the post-processed SNR for each transmitted data stream, as received at the receiver unit).

[0266] In yet another embodiment, the partial CSI comprises a data rate indicator for each transmit data stream. The quality of the transmission channels to be used for data transmission may be determined initially (e.g., based on the SNR estimated for the transmission channel) and a data rate corresponding to the determined channel quality may then be identified (e.g., based on a look-up table) for each transmission channel or each group of transmission channels. The identified data rate is indicative of the maximum data rate that may be transmitted on the transmission channel for the required level of performance. The data rate may be mapped to and represented by a data rate indicator (DRI), which may be efficiently coded. For example, if (up to) seven possible data rates are supported by the transmitter unit for each transmit antenna, then a 3-bit value may be used to represent the DRI where, e.g., a zero may indicate a data rate of zero (i.e., don't use the transmit antenna) and 1 through 7 may be used to indicate seven different data rates. In a typical implementation, the channel quality measurements (e.g., the SNR estimates) are mapped directly to the DRI based on, e.g., a look-up table.

[0267] In yet another embodiment, the partial CSI comprises a rate to be used at the transmitter unit for each data stream. In this embodiment, the rate may identify the particular coding and modulation scheme to be used for the data stream such that the desired level of performance is achieved.

[0268] In yet another embodiment, the partial CSI comprises a differential indicator for a particular measure of quality for a transmission channel. Initially, the SNR or DRI or some other quality measurement for the transmission channel is determined and reported as a reference measurement value. Thereafter, monitoring of the quality of the link continues, and the difference between the last reported measurement and the current measurement is determined. The difference may then be quantized to one or more bits, and the quantized difference is mapped to and represented by the differential indicator, which is then reported. The differential indicator may indicate an increase or decrease to the last reported measurement by a particular step size (or to maintain the last reported measurement). For example, the differential indicator may indicate that (1) the observed SNR for a particular transmission channel has increased or decreased by a particular step size, or (2) the data rate should be adjusted by a particular amount, or some other change. The reference measurement may be transmitted periodically to

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ensure that errors in the differential indicators and/or erroneous reception of these indicators do not accumulate.

[0269] Full CSI includes sufficient characterization (e.g., the complex gain) across the entire system bandwidth (i.e., each frequency subchannel) for the propagation path between each transmit-receive antenna pair in the N.sub.R.times.N.sub.T channel response matrix H(k).

[0270] In one embodiment, the full CSI comprises eigenmodes plus any other information that is indicative of, or equivalent to, SNR. For example, the SNR-related information may be a data rate indication per eigenmode, an indication of the coding and modulation scheme to be used per eigenmode, the signal and interference power per eigenmode, the signal to interference ratio per eigenmode, and so on. The information described above for the partial CSI may also be provided as the SNR related information.

[0271] In another embodiment, the full CSI comprises a matrix A=H.sup.HH. This matrix A is sufficient to determine the eigenmodes and eigenvalues of the channel, and may be a more efficient representation of the channel (e.g., fewer bits may be required to transmit the full CSI for this representation).

[0272] Differential update techniques may also be used for all of the full CSI data types. For example, differential updates to the full CSI characterization may be sent periodically, when the channel changes by some amount, and so on.

[0273] Other forms of full or partial CSI may also be used and are within the scope of the invention. In general, the full or partial CSI includes sufficient information in whatever form that may be used to adjust the processing at the transmitter unit such that the desired level of performance is achieved for the transmitted data streams.

Deriving and Reporting CSI

[0274] The CSI may be derived based on the signals transmitted by the transmitter unit and received at the receiver unit. In an embodiment, the CSI is derived based on a pilot included in the transmitted signals. Alternatively or additionally, the CSI may be derived based on the data included in the transmitted signals.

[0275] In yet another embodiment, the CSI comprises one or more signals transmitted on the reverse link from the receiver unit to the

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transmitter unit. In some systems, a degree of correlation may exist between the downlink and uplink (e.g. for time division duplexed (TDD) systems, where the uplink and downlink share the same system bandwidth in a time division multiplexed manner). In these systems, the quality of the downlink may be estimated (to a requisite degree of accuracy) based on the quality of the uplink, which may be estimated based on signals (e.g., pilot signals) transmitted from the receiver unit. The pilot signals transmitted on the uplink would then represent a means by which the transmitter unit could estimate the CSI as observed at the receiver unit. In TDD systems, the transmitter unit can derive the channel response matrix H(k) (e.g., based on the pilot transmitted on the uplink), account for differences between the transmit and receive array manifolds, and receive an estimate of the noise variance at the receiver unit. The array manifold deltas may be resolved by a periodic calibration procedure that may involve feedback between the receiver unit and transmitter unit.

There is nothing in those paragraphs that teaches or even suggests using long term information for determining which of a finite set of codes to use to decode short term information. There is nothing that corresponds to the claimed "finite set of codes" or any indication that any transmitted long term information would somehow be used to determine which of a finite set of codes would be used for decoding short term information.

Therefore, even if the proposed combination could be made, none of claims 9 or 15-17 can be considered obvious because the result of the proposed combination is not the same as what is recited in Applicant's claims.

Claim 17 is separately patentable.

There is no prima facie case of obviousness against Claim 17 for the same reasons that there is no prima facie case against claims 9, 15 and 16. Claim 17 is additionally patentable because the proposed modification to the Kim reference required to attempt to arrive at the invention of claim 17 would change the principle of operation of the arrangement of the Kim

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reference and would render it unsatisfactory for its intended purpose. As mentioned above, the Kim reference expressly requires a mobile station to transmit long-term and short-term information to a base station. The base station in the Kim reference then uses that information to achieve the intended result of the Kim reference. If one were to modify the Kim reference by having the base station transmit the long-term and short-term information instead of the mobile station, then the base station would not get the information that it needs to achieve its intended purpose according to the teachings of the Kim reference. In other words, having the base station of the modified Kim reference perform the function of the mobile station of the Kim reference would change the principle of operation of the Kim reference in a manner that is not permitted when attempting to establish a prima facie case of obviousness. The proposed combination of references used to reject claim 17, therefore, cannot be made.

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CONCLUSION

The Examiner's proposed combinations do not provide the results suggested by the Examiner because the references do not teach what the Examiner contends. In some instances, the proposed combinations cannot be made because they require changing the principle of operation of the primary reference and render it unsatisfactory for its intended purpose. There is no prima facie case of obviousness against any of claims 5, 9, or 15-17. The rejections against those claims must be reversed.

Respectfully submitted,

CARLSON, GASKEY & OLDS, P.C.

_____August 28, 2007_____
Date

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CERTIFICATE OF FACSIMILE

I hereby certify that this Appeal Brief, relative to Application Serial No. 10/603,290, is being facsimile transmitted to the Patent and Trademark Office (Fax No. (571) 273-8300) on August 28, 2007.

David Gaskey

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APPENDIX OF CLAIMS

1.   A method of transmitting information in a communication system having at least one multiple antenna system, the method comprising the step of:

transmitting over N defined time periods long term information comprising a correlation value between at least two antennas that is a function of a signal vector received on the at least two antennas arranged in a particular format and obtained from at least a portion of at least one of measured or calculated received information where N is an integer equal to 1 or greater.

5.   The method of claim 1 where the long term information is transmitted by a base station of a wireless communication system.

9.   A method of transmitting information in a communication system having at least one multiple antenna system, the method comprising:

transmitting over N defined time periods long term information arranged in a particular format and obtained from at least a portion of at least one of measured or calculated received information, where N is an integer equal to 1 or greater; and

transmitting short term information where the long term information is used to inform a receiver which of a finite set of codes to use to decode the transmitted short term information.

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15.   A method of receiving information in a communication system having at least one multiple antenna system, the method comprising:

receiving long term information arranged in a particular format and transmitted over N defined time periods where N is an integer equal to 1 or greater;

receiving short term information related to the long term information; and

determining which of a finite set of codes to use to decode the short term information based upon the long term information.

16.   The method of claim 15 further comprising the step of modifying information to be transmitted based on the received long term and related short term information.

17.   The method of claim 15 where a mobile receives the long term information and related short term information.

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EVIDENCE APPENDIX

None.

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RELATED PROCEEDINGS APPENDIX

None.